

Quasi Natural
Representation Theory-
Volume 1
{First Edition}

Original Research Work Of Mr. Ramesh Chandra Bagadi

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DEDICATION

This text is dedicated to the all compassionate *Creator* of the *Universe*.

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1 INTRODUCTION

Representation of the Environment around man has been a greatest problem for mankind from time immemorial. Optimal representations of the environment always helped him gain proper insight into the workings of the Universe and helped him model the Environment around him appropriately for his benefit of survival.

To this end, the author develops a Novel Natural Representation Theory using Primes, the main development of this research being that *Any Aspect Is Actually A Number And Vice-Versa*. Noted philosopher and mathematician *George Cantor*, did say this in a passive sense, centuries earlier, that for every Physical Phenomena, there is a Mathematical Construct and vice-versa. In this book, the author was just able to prove Cantor's conjecture technically. The Volume 1 of this title covers basically the afore stated idea and the upcoming Volume 2 of this title covers all the Mathematical Tools necessary for Natural Representation of almost any aspect in terms of functions comprising of Primes and Prime Like Numbers. Also, the notion of Complement of any Number, Set is also presented.

2 IDENTIFICATION AND PREDICTION OF PRIME NUMBERS

Primeness Test

In this research section, the author presents a ‘*Primeness Test*’ which can be used to test if any given number is Prime.

Given any Positive Integer Number g_n , usually written in Base 10 as

$$g_n = a_k a_{k-1} a_{k-2} \dots a_3 a_2 a_1 a_0 \text{ where}$$

$$a_k a_{k-1} a_{k-2} \dots a_3 a_2 a_1 a_0 = \sum_{i=0}^k (a_i)(10)^i$$

which can be written as

$$\sum_{i=0}^k (a_i)(10)^i = a_0 + (p_n - a_0)$$

Letting $(p_n - a_0) = z$ we note that z is a multiple of 10.

If g_n is to be Prime, then the values of a_0 cannot be Even, i.e., it must be Odd. This implies that z must be Even. Also, a_0 can possibly take the values of 1, 3, 7 and 9 only as it being 5 implies that g_n is divisible by 5. If g_n is not a Prime, we can write it as

$$g_n = a_0 + z = r_1 \text{ and/ or}$$

$$g_n = a_0 + z = 3r_2 \text{ and/ or}$$

$$g_n = a_0 + z = 7r_3 \text{ and/ or}$$

$$g_n = a_0 + z = 9r_4$$

For the case of Divisibility by 3, we write

$$r_1 = \frac{a_0}{3} + \frac{z}{3}$$

Since z is a multiple of 10, we can check if it is multiple of 3 by checking if

$$z = 3(10)^{m_{10}} \text{ for } m_{10} = 1 \text{ to } g_{m_{10}} \text{ such that } 3(10)^{g_{m_{10}}+1} > z$$

Also, since z is a multiple of 10, we can check if it is multiple of 3 by checking if

$$z = 3(20)^{m_{20}} \text{ for } m_{20} = 1 \text{ to } g_{m_{20}} \text{ such that } 3(20)^{g_{m_{20}}+1} > z$$

We repeat this procedure, so on, so forth until

.

.

.

$z = 3(80)^{m_{80}}$ for $m_{80} = 1$ to $g_{m_{80}}$ such that $3(80)^{g_{m_{80}}+1} > z$ and

$z = 3(90)^{m_{90}}$ for $m_{90} = 1$ to $g_{m_{90}}$ such that $3(90)^{g_{m_{90}}+1} > z$

If z is divisible by 3, and since a_0 can take values of 0 and 3 only, therefore, g_n is divisible by 3.

We now present the analysis as follows:

<i>Divisibility by 3</i>		
a_0	z is divisible by 3	z is not divisible by 3
1	$a_0 + z$ is not divisible by 3	When z is not divisible by 3, it is either lacking and/ or in excess by
		± 1 gives $\pm 1 + 1 = 2, 0$ Hence, $a_0 + z$ is not divisible by 3 for the case of $+1$ (lacking and/ or in excess by) but is divisible by 3 for the case of -1 (lacking and/ or in excess by)
		± 2 gives $\pm 2 + 1 = 3, -1$ Hence, $a_0 + z$ is divisible by 3 for the case of $+2$ (lacking and/ or in excess by) but is not divisible by 3 for the case of -2 (lacking and/ or in excess by)

a_0	z is divisible by 3	z is not divisible by 3
3	$a_0 + z$ is divisible by 3	When z is not divisible by 3, it is either lacking and/ or in excess by
		± 1 gives $\pm 1 + 3 = 4, 2$ Hence, $a_0 + z$ is not divisible by 3

		± 2 gives $\pm 2 + 3 = 5, 1$ Hence, $a_0 + z$ is not divisible by 3
--	--	--

a_0	z is divisible by 3	z is not divisible by 3			
7	$a_0 + z$ is not divisible by 3	<table><tr><td>When z is not divisible by 3, it is either lacking and/ or in excess by</td></tr><tr><td>± 1 gives $\pm 1 + 7 = 8, 6$ Hence, $a_0 + z$ is not divisible by 3 for the case of $+1$ (lacking and/ or in excess by) but is divisible by 3 for the case of -1 (lacking and/ or in excess by)</td></tr><tr><td>± 2 gives $\pm 2 + 7 = 9, 5$ Hence, $a_0 + z$ is divisible by 3 for the case of $+2$ (lacking and/ or in excess by) but is not divisible by 3 for the case of -2 (lacking and/ or in excess by)</td></tr></table>	When z is not divisible by 3, it is either lacking and/ or in excess by	± 1 gives $\pm 1 + 7 = 8, 6$ Hence, $a_0 + z$ is not divisible by 3 for the case of $+1$ (lacking and/ or in excess by) but is divisible by 3 for the case of -1 (lacking and/ or in excess by)	± 2 gives $\pm 2 + 7 = 9, 5$ Hence, $a_0 + z$ is divisible by 3 for the case of $+2$ (lacking and/ or in excess by) but is not divisible by 3 for the case of -2 (lacking and/ or in excess by)
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a_0	z is divisible by 3	z is not divisible by 3						
9	$a_0 + z$ is divisible by 3	<table><tr><td colspan="2">When z is not divisible by 3, it is either lacking and/ or in excess by</td></tr><tr><td>± 1 gives</td><td>$\pm 1 + 9 = 10, 8$ Hence, $a_0 + z$ is not divisible by 3</td></tr><tr><td>± 2 gives</td><td>$\pm 2 + 9 = 11, 7$ Hence, $a_0 + z$ is not divisible by 3</td></tr></table>	When z is not divisible by 3, it is either lacking and/ or in excess by		± 1 gives	$\pm 1 + 9 = 10, 8$ Hence, $a_0 + z$ is not divisible by 3	± 2 gives	$\pm 2 + 9 = 11, 7$ Hence, $a_0 + z$ is not divisible by 3
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± 2 gives	$\pm 2 + 9 = 11, 7$ Hence, $a_0 + z$ is not divisible by 3							

We repeat the same procedural analysis for

a_0

equal to 7 and 9.

From the above all cases, we can infer if

$$g_n$$

is Prime or not.

We can note that this test so far cannot ascertain the Primeness of a number ending with 1.

For such numbers, we present the following scheme of ascertaining their Primeness.

In this case, we write

$$g_n$$

as

$$g_n = b_0 - 9$$

where

$$b_0$$

is a multiple of 10.

We now follow a similar scheme as detailed already to ascertain if

$$g_n$$

is Prime or not.

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3 HIGHER ORDER SEQUENCE(S) OF PRIMES

Since, the dawn of civilization, human kind has been leaning on the Sequence of Primes to devise Evolution Schemes akin to the behavior of the Distribution of Primes, in an attempt to mimic natural phenomenon and be able to forecast useful aspects of science of the aforementioned phenomenon. Many western and as well as oriental Mathematicians and Physicists have understood the importance of Prime Numbers (in the ambit of Quantum Groups, Hopf Algebras, Differentiable Quantum Manifolds, etc.,) in understanding subatomic processes such as Symmetry Breaking, Standard Model Explanation, etc. In this research note, the author advocates a novel concept of Higher Order Sequence Of Primes.

Theory Of Higher Order Sequence Of Primes [1], [2], [3]

A Positive Integer Number is considered as a Prime Number in a Certain Higher Order (Positive Integer ≥ 2) Space, say R , if it is factorizable into a Product of $(R-1)$ factors wherein the factors are $(R-1)$ number of Distinct Non-Reducible Positive Integer Numbers (Primes of 2nd Order Space).

Example 1

The general Primes that we usually refer to can be called as Primes of 2nd Order Space.

Example 2

<i>First Few Elements Of Sequence's Of Higher Order Space Primes</i>	<i>Rth Order Space</i>
{2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, ...}	R=2
{6 (3x2), 10 (5x2), 14 (7x2), 15 (5x3), 21 (7x3), 22 (11x2), 26 (13x2), 33 (11x3), 34 (17x2), 35 (7x5), 38 (19x2), 39, (13x3), 45 (9x5), ... }	R=3
{30 (5x3x2), 42 (7x3x2), 70 (7x5x2), 84 (7x4x3), 102 (17x3x2), 105 (17x3x2), 110 (11x5x2), 114 (19x3x2), 130 (13x5x2), ...}	R=4
{210 (7x5x3x2), 275 (11x5x3x2), 482 (11x7x3x2), 770 (11x7x5x2), 1155 (11x7x5x3), ...}	R=5

We can note that the Primes of any Integral (Positive Integer ≥ 2) Order Space (say R) can be arranged in an increasing order and their position in this order denotes their Higher Order Space Prime Metric Basis Position Number.

We can generate the Sequence Of Any Integral (Positive Integer ≥ 2) Higher Order Primes in the following fashion:

The First Prime of any R^{th} Order Space Sequence Of Primes can be computed by simply considering consecutively the First (R-1) Number of Primes of 2nd Order Space Sequence Of Primes, starting from the First Prime of 2nd Order Space Sequence Of Primes, i.e., 2 and Forming a Product Term of the Form

$${}^R p_1 = \overbrace{\left\{ {}^2 2_1 \times {}^2 3_2 \times {}^2 5_3 \times {}^2 7_4 \times \dots \dots \dots \right\}}^{(R-1) \text{ Number Of Product Forming Factors}} \times \left\{ {}^2 p_{(R-3)} \right\} \times \left\{ {}^2 p_{(R-2)} \right\} \times \left\{ {}^2 p_{(R-1)} \right\}$$

which becomes the First Prime of any R^{th} Order (Positive Integer ≥ 2) Space Sequence Of Primes as it cannot be factored in terms of R Number of Unique Factors. We Label this Number as ${}^R p_1$

One Step Evolution [4], [5] of any element of Second Order Space Sequence Of Primes is the next consecutive Second Order Space Prime element of the given element of Second Order Space Sequence Of Primes. For Example, One Step Evolution of 2 is 3 and of 31 is 37.

The Second Prime of any R^{th} Order (Positive Integer ≥ 2) Space Sequence Of Primes can be computed in the following fashion.

Firstly, we consider consecutively the First (R-1) Number of Primes of 2nd Order Space Sequence Of Primes, starting from the First Prime of 2nd Order Space Sequence Of Primes, i.e., 2 and forming a Product Term of the form

$${}^R p_1 = \overbrace{\left\{ {}^2 2_1 \times {}^2 3_2 \times {}^2 5_3 \times {}^2 7_4 \times \dots \dots \dots \right\}}^{(R-1) \text{ Number Of Product Forming Factors}} \times \left\{ {}^2 p_{(R-3)} \right\} \times \left\{ {}^2 p_{(R-2)} \right\} \times \left\{ {}^2 p_{(R-1)} \right\}$$

which becomes the First Prime of any R^{th} Order (Positive Integer ≥ 2) Space Sequence Of Primes as it cannot be factored in terms of R Number of Unique Factors. We now cause One Step Evolution of that one particular factor among the (R-1) factors such that the Product climb of the value ${}^R p_2$ over ${}^R p_1$ is minimum as compared to that gotten by performing the same using any other factor among the (R-1) factors.

{One Step Devolution [4], [5] of any element of Second Order Space Sequence Of Primes is the just previous Second Order Space Prime element of the given element of Second Order Space Sequence Of Primes. For Example, One Step Devolution of 3 is 2 and of 37 is 31}.

We find ${}^R p_3$ using ${}^R p_2$ as detailed in the above paragraph, and similarly, we can find any element of the R^{th} Order Sequence Of Primes.

For Example, 210 is the 1st (Higher Order Space Prime Metric Basis Position Number) element of $R=5^{th}$ Order Space Sequence Of Primes.

Similarly, 102 is the 5th (Higher Order Space Prime Metric Basis Position Number) element of $R=4^{th}$ Order Space Sequence Of Primes.

Therefore, any of these Higher Order Space Primes can be represented as follows:

Higher Order Space Number (*Number*) Higher Order Space Prime Metric Basis Position Number

That is,

210 can be written as ${}^5 210_1$ and 102 can be written as ${}^4 210_5$.

Each of the rest of the Positive Integers can be classified to belong to it's Unique Parent Sequence Of Higher Non Integral Order Space Primes, at a particular Prime Metric Basis Position Number.

That is, for any Positive Integer, we can use the Method of One Step Evolution successively (as detailed in [4], [5]) and can find all the elements greater than it up to a certain limit. Similarly, we can use the Method Of One Step Devolution successively (as detailed in [4], [5]) and can find all the elements lower than it but greater than zero. These set of numbers when arranged in an order form a Sequence, namely the Sequence Of Higher (Positive Non Integer Order) Primes, of some particular Positive Non Integer Order.

For Example, One Step Evolution of 40,500 is 56,700, see [4], [5], i.e., if 40,500 is ${}^R 40500_d$, then 56,700 is ${}^R 56700_{(d+1)}$

Furthermore, as a matter of fact, any of rest of the positive integers other than the Sequence of Primes of Any Higher Order (Positive Integer greater than or equal to 2) Space can be written as follows:

Coarser Representation Of positive integers other than the Sequence of Primes of Any Higher Order (Positive Integer greater than or equal to 2) Space

Considering any number say f , we can write its nearest primes of any R^{th} Order Space, on either side as ${}^R p_k$ and ${}^R p_{k+1}$, where ${}^R p_k$ is the k^{th} Prime and ${}^R p_{k+1}$ is the $(k+1)^{\text{th}}$ Prime of the Sequence Of Primes Of the R^{th} Order (Positive Integer ≥ 2) Space. We can then

write $f = {}^R p_{k+\alpha}$ where $\alpha = \left(\frac{f - {}^R p_k}{{}^R p_{k+1} - {}^R p_k} \right) \left(\frac{{}^R P_{(f - {}^R p_k)}}{{}^R P_{({}^R p_{k+1} - {}^R p_k)}} \right)$ with

$0 < \alpha < 1$. Then, $(k + \alpha)$ is the Non Integral Prime Basis Position

Number of f . In a similar fashion, any Rational Number $\frac{a}{b}$ can be

written as $\frac{a}{b} = \frac{{}^R p_{k+\alpha}}{{}^R p_{l+\beta}}$ where k, l are some positive integers and

$0 < \alpha, \beta < 1$.

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4 HIGHER ORDER SEQUENCE(S) OF FRACTIONAL PRIMES

*Finer Representation Of Any Natural Number In Terms Of Primes Basis
Position Number Of Any Positive Integer Order Sequence Of Primes*

Considering any Natural Number q , and any Positive Integer Order Number r , we first find two r^{th} Order Sequence Primes that bound r , i.e., ${}^r p_{u_1} < q < {}^r p_{u_1+1}$ where u_1 is a Positive Integer such that ${}^r p_{u_1}$ is the Largest r^{th} Order Sequence Of Primes element that is less than q and p_{u_1+1} is the Smallest r^{th} Order Sequence of Primes element that is greater than q .

Then q can be represented as

$$q = {}^r p_v \text{ where } v = u_1 + \left\{ \frac{q - {}^r p_{u_1}}{{}^r p_{u_1+1} - {}^r p_{u_1}} \right\} = u_1 + \left(\frac{\delta_{N1}}{\delta_{D1}} \right)$$

However, we can note that this is not the Best Representation for v . Therefore, we multiply $(q - {}^r p_{u_1})$ by a Smallest Natural Number a_1 such that $a_1(q - {}^r p_{u_1}) \geq {}^r p_{u_1+1}$. Therefore, we now also multiply the value $({}^r p_{u_1+1} - {}^r p_{u_1})$ by a_1 as well. Now, we inspect the Set of r^{th} Order Primes for an element ${}^r p_{u_{N1}}$ such that ${}^r p_{u_{N1}}$ is the Largest r^{th} Order Sequence of Prime Element (of Position Number u_{N1}) which is less than $a_1(q - {}^r p_{u_1})$ and similarly, we inspect the Set of r^{th} Order Primes for an element ${}^r p_{u_{D1}}$ such that ${}^r p_{u_{D1}}$ is the Largest r^{th} Order Sequence of Prime Element (of Position Number u_{N1}) which is less than $a_1({}^r p_{u_1+1} - {}^r p_{u_1})$.

Therefore, we can write

$$\left(\frac{\delta_{N1}}{\delta_{D1}} \right) = \left(\frac{{}^r p_{u_{N1}}}{{}^r p_{u_{D1}}} \right) + \left(\frac{\delta_{N2}}{\delta_{D2}} \right)$$

We again re-write

$$\left(\frac{\delta_{N2}}{\delta_{D2}} \right) = \left(\frac{{}^r p_{u_{N2}}}{{}^r p_{u_{D2}}} \right) + \left(\frac{\delta_{N3}}{\delta_{D3}} \right)$$

Using the aforementioned scheme analogously and keep finding the best or accurate possible value by doing as many iterations as necessary for the desired accuracy.

To elaborate further, we write the Residue

$$\left(\frac{\delta_{N1}}{\delta_{D1}} \right) - \left(\frac{{}^r p_{u_{N1}}}{{}^r p_{u_{D1}}} \right) = \left(\frac{\delta_{N2}}{\delta_{D2}} \right), \text{ i.e., as a Fraction whose Numerator and}$$

Denominator are both Natural Numbers. We then find ${}^r p_{u_{N2}}$ such that it is the Largest element of the r^{th} Order Sequence Of Primes Set and which is Smaller than δ_{N2} . Similarly, we find ${}^r p_{u_{D2}}$ such that it is the Largest element of the r^{th} Order Sequence Of Primes Set and which is Smaller than δ_{D2} . We now write the Residue

$$\left(\frac{\delta_{N2}}{\delta_{D2}} \right) - \left(\frac{{}^r p_{u_{N2}}}{{}^r p_{u_{D2}}} \right) = \left(\frac{\delta_{N3}}{\delta_{D3}} \right)$$

We should note that if δ_{N2} and δ_{D2} are Small Numbers, we can multiply the δ_{N2} and δ_{D2} by some Natural Number a_2 such that they are sufficiently large enough to capture the desired accuracy of our representation. We can note that in the relation $a_1(q - {}^r p_{u_1}) \geq {}^r p_{u_1+1}$ already mentioned, we can have a_1 replaced by a Natural Number much larger than a_1 so as to capture the desired accuracy of our representation. We can now re-write

$$\left(\frac{\delta_{N3}}{\delta_{D3}} \right) - \left(\frac{{}^r p_{u_{N3}}}{{}^r p_{u_{D3}}} \right) = \left(\frac{\delta_{N4}}{\delta_{D4}} \right)$$

In this fashion, we can represent any number q in terms of a Non Integral Prime Basis Position Number of r^{th} Order Sequence Of Primes. That is, we can write

$$q = {}^r p_v$$

$$q = {}^r p_{u_1 + \left(\frac{\delta_{N1}}{\delta_{D1}} \right)}$$

And so on, so forth as,

$$q = {}^r p_{u_1 + \sum_{i=1}^{\infty} \left(\frac{\xi_{uNi}}{\delta_{Di}} \right)}$$

where

$$\xi_{uNi} = \left(\frac{{}^r p_{uNi}}{{}^r p_{uD_i}} \right)$$

Lateral Cross Higher Order Sequences Of Primes

Case 1: If N and ${}^N p_{j_1+1}$ are both Positive Integers.

For any ${}^N p_{j_1}$ and ${}^N p_{j_1+1}$ where j_1 is a Positive Integer, using the One Step Evolution Theory detailed in the next chapter, we find the next number ${}^{N+1} p_{j_2+\delta_2}$ of ${}^N p_{j_1}$ lying as shown in the relation ${}^{N+1} p_{j_2} < {}^{N+1} p_{j_2+\delta_2} < {}^{N+1} p_{j_2+1}$ also while satisfying the relationship ${}^N p_{j_1} < {}^{N+1} p_{j_2+\delta_2} < {}^N p_{j_1+1}$ for some Positive Integer j_2 . Similarly, for this ${}^{N+1} p_{j_2+\delta_2}$, we find the next number ${}^{N+2} p_{j_3+\delta_3}$ satisfying the relationship ${}^{N+2} p_{j_3} < {}^{N+2} p_{j_3+\delta_3} < {}^{N+2} p_{j_3+1}$ for some Positive Integer j_3 and so on so forth up to a certain desired limit. These thusly found numbers ${}^{N+1} p_{j_2+\delta_2}$, ${}^{N+2} p_{j_3+\delta_3}$, ${}^{N+3} p_{j_4+\delta_4}$,, can be referred to as the *Lateral Cross Higher Order Fractional Primes*.

Case 2: If N is a Positive Integer and ${}^N p_{j_1+1}$ is not a Positive Integer.

Here, we write ${}^N p_{j_1+1}$ as a Ratio of any two Positive Integers and divide the results gotten using the above concept accordingly.

Case 3: If N is not a Positive Integer and ${}^N p_{j_1+1}$ is also not a Positive Integer.

Representation wise, this case can be reduced to Case 2, and hence can be analyzed accordingly for the cases wherein we vary the r_1, r_2, r_3, M and Q for Optimal values which satisfy the below equations.

$$\text{Case a: } {}^N P_{j_1+1} = \left(\frac{{}^M P_{r_1}}{{}^M P_{r_2}} \right)$$

$$\text{Case b: } {}^N P_{j_1+1} = \left(\frac{{}^M P_{r_1}}{{}^Q P_{r_3}} \right)$$

Existence Of A Global N value for a Set of Numbers

For a given Set of Numbers, we can firstly slate all those numbers in some Specific Order, say R , i.e., as elements of R^{th} Order Sequence Of Primes. The Prime Basis Position Numbers of these elements may or may not be Positive Integers. We can also note that we can use some common Scalar number (the LCM as will be detailed in a few lines from now) as multiplier to the Set of these numbers which are now represented in terms of a Positive Integer Prime Basis Position Numbers gotten by considering the LCM of the Denominators of the Non Integral Prime Basis Position Numbers, represented as Rationals, and then rewriting the Numerator Values as Product of the already existing Numerator Value and the ratio of the LCM and the Denominator Value.

5 THE ANANDA-DAMAYANTHI-RADHA-ROHITH RISHI SEQUENCE TRENDS (PRIME LIKE TRENDS) OF ANY SET OF POSITIVE REAL NUMBERS

Scheme Of Finding The Prime Like Trends Of A Given Set Of Positive Numbers

Say any Set S , is given all of whose elements belong to the Set of Natural Numbers. Let the Cardinality of the Set be n . Furthermore, these numbers are arranged in an ascending order.

Representation Of Any Natural Number As A Special Sum Of Primes

a) 1 is the First Prime

For the given set ${}_1S$, we index the elements with their Prime Position Basis Numbers. Let this Set be ${}_1J$. We now do Cartesian cross product of ${}_1J$ with ${}_1J$, i.e., we find ${}_1J \times {}_1J$. Now, for these ${}_1n^2$ number of ordered pairs $(u1, v1)$, we find the absolute value of the difference $\delta_{(u1, v1)}$ between them. We now separately collect all the u, v 's for $\delta_{(u1, v1)} = 1$,

$$\delta_{(u1, v1)} = 2, \delta_{(u1, v1)} = 3, \dots, \delta_{(u1, v1)} = \left(\frac{{}_1n - 1}{2} \right) \text{ if } {}_1n \text{ is odd or}$$

$$\delta_{(u1, v1)} = \left(\frac{{}_1n}{2} \right) \text{ if } {}_1n \text{ is even and call them as a set each. The thusly}$$

gotten sets are the desired sets.

Once, we get the locations (Prime Metric Basis Positions Numbers Of The Primes of the given Set ${}_1S$) of the thusly Decomposed Sets of the given Set ${}_1S$, we can now write the Decomposed Sets of Set ${}_1S$ in terms of the Primes representing their Prime Basis Position Numbers.

We now conduct similar analysis for all the rest of the Order Element Sets and finally add the individual components to get the desired Trends as detailed in the following example.

Example 3: When the elements of S are all Primes.

$$S = \{3, 5, 7, 13, 29, 31, 53, 61, 67\}$$

Then

$$J = \{3, 4, 5, 7, 11, 12, 17, 19, 20\}$$

Here, 1 is taken as the first Prime.

We now create a table of difference between u and v of the ordered pairs of J X J as shown

Table 1: *Table of difference between u1 and v1 of the ordered pairs of $J \times J$*

	3	4	5	7	11	12	17	19	20
3	0	1	2	4	8	9	14	16	17
4	1	0	1	3	7	8	13	15	16
5	2	1	0	2	6	7	12	14	15
7	4	3	2	0	4	5	10	12	13
11	8	7	6	4	0	1	6	8	9
12	9	8	7	5	1	0	5	7	8
17	14	13	12	10	6	5	0	2	3
19	16	15	14	12	8	7	2	0	1
20	17	16	15	13	9	8	3	1	0

Needless to mention, the Set with $(u1, v1)$ difference equal to 1 is the Set J itself. We now find all the pairs with $(u1, v1)$ difference = 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17

Table 2: *Table of distilled Non Unique Prime Trends*

2	$\{3, 5, 7\}$ $\{17, 19\}$
3	$\{4, 7\}$ $\{17, 20\}$
4	$\{3, 7, 11\}$
5	$\{7, 12, 17\}$
6	$\{5, 11, 17\}$
7	$\{4, 11\}$ $\{5, 12, 19\}$
8	$\{3, 11, 19\}$ $\{4, 12, 20\}$
9	$\{3, 12\}$ $\{11, 20\}$
10	$\{7, 17\}$

11	None
12	$\{5,17\}$ $\{7,19\}$
13	$\{7,20\}$ $\{4,17\}$
14	$\{3,17\}$ $\{5,19\}$
15	$\{4,19\}$ $\{5,20\}$
16	$\{3,19\}$ $\{4,20\}$
17	$\{3,20\}$

These Sets

$\{3,5,7\}$ which is $\{3,7,13\}$
 $\{17,19\}$ which is $\{53,61\}$
 $\{4,7\}$ which is $\{5,13\}$
 $\{17,20\}$ which is $\{53,67\}$
 $\{3,7,11\}$ which is $\{3,13,29\}$
 $\{7,12,17\}$ which is $\{13,31,53\}$
 $\{5,11,17\}$ which is $\{7,29,53\}$
 $\{4,11\}$ which is $\{5,29\}$
 $\{5,12,19\}$ which is $\{7,31,61\}$
 $\{3,11,19\}$ which is $\{3,29,61\}$
 $\{4,12,20\}$ which is $\{5,31,67\}$
 $\{3,12\}$ which is $\{3,31\}$
 $\{11,20\}$ which is $\{29,67\}$
 $\{7,17\}$ which is $\{13,53\}$
 $\{5,17\}$ which is $\{7,53\}$
 $\{7,19\}$ which is $\{13,61\}$
 $\{7,20\}$ which is $\{13,67\}$
 $\{4,17\}$ which is $\{5,53\}$
 $\{3,17\}$ which is $\{3,53\}$
 $\{5,19\}$ which is $\{7,61\}$
 $\{4,19\}$ which is $\{5,61\}$
 $\{5,20\}$ which is $\{7,67\}$
 $\{3,19\}$ which is $\{3, 61\}$
 $\{4,20\}$ which is $\{5,67\}$
 $\{3,20\}$ which is $\{3,67\}$

can be called the Sets gotten by *Holistic Decomposition Of The Given Set S Of Primes As One Or More Sets Each With Some Periodicity Of The Prime Number's Basis Position Number*.

This set of Sets can also be called as the *Primality Tree Set of Type 1* the given Set S.

Example 4: When the elements of S are not all Primes.

$$S = \{8, 27, 34\}$$

$$S = \{(7+1+0), (23+3+1), (31+3+0)\}$$

This gives

$${}_1J = \{5, 10, 12\}$$

$${}_2J = \{1, 3, 3\}$$

$${}_3J = \{0, 1, 0\}$$

For facilitating the addition of Component Prime Trends later on, we can use *Left Sub Pre Tag* and *Right Sub Post Tag* to each of the sum Terms (of J) so that later on we know which ones to add on to before and after.

That is, for,

$$S = \{(7+1+0), (23+3+1), (31+3+0)\}$$

We write it as

$$S = \{(7_1+{}_71_0+{}_10), (23_3+{}_{23}3_1+{}_31), (31_3+{}_{31}3_0+{}_30)\}$$

$$\text{Then } {}_1S = \{(7_1), (23_3), (31_3)\}$$

$${}_2S = \{({}_71_0), ({}_{23}3_1), ({}_{31}3_0)\}$$

$${}_3S = \{({}_10), ({}_31), ({}_30)\}$$

$$\text{Doing the Prime Trends Analysis on } {}_1S = \{(7_1), (23_3), (31_3)\}$$

gives

$$\{10, 12\} \Rightarrow \{23, 31\}$$

$$\{5, 10\} \Rightarrow \{7, 23\}$$

$$\{5, 12\} \Rightarrow \{7, 31\}.$$

Similarly,

doing the Prime Trends Analysis on

$${}_2S = \{({}_71_0), ({}_{23}3_1), ({}_{31}3_0)\}$$

gives

$$\{1, 3\} \Rightarrow \{1, 3\}$$

$$\{1, 3\} \Rightarrow \{1, 3\}$$

Similarly,
doing the Prime Trends Analysis on

$${}_3S = \{({}_10),({}_31),({}_30)\}$$

gives

$$\{0,1\} \Rightarrow \{0,1\}$$

Now, using the Primes Sum expression carefully for each term of S, we sum the appropriate terms of the Component Prime Trends, to get the Composite Trends.

This gives us,

$$\{27,34\} = \{(23+3+1),(31+3)\}$$

$$\{8,27\} = \{(7+1),(23+3+1)\}$$

$$\{8,34\} = \{(7+1),(31+3)\}$$

which can be called as the Sets gotten by *Holistic Decomposition Of The Given Set Of Natural Numbers As One Or More Sets Each With Some Periodicity Of The Number's Prime Basis Position Number*.

This set of Sets can also be called as the *Primality Tree Set* of the Set S of *Type 1*.

Method 2 Of Finding The Prime Like Trends Of A Given Set Of Positive Numbers

Say any Set S , is given all of whose elements belong to the Set of Natural Numbers. Let the Cardinality of the Set be n . Furthermore, these numbers are arranged in an ascending order.

For each element of the Set, using the method of One Step Evolution detailed in R. C. Bagadi [1], we find out at what Prime Like Basis Position Number each other element belongs to along its successive One Step Evolution and also successive One Step Devolution. Once, we write those, we check if they are one step periodic, two, step periodic, and so on so forth to exhaustion. We For each element, we collect all the elements of the given Set that form Prime Like sequences that are either one step periodic, two, step periodic, and so on so forth to exhaustion. In this fashion, we do it for all the elements of the Set. From this, we can now clearly see, all the Prime Like Trends that have some periodicity. *By Prime Like Trend, we mean a Sequence whose periodicity is some positive integer multiple of the Integral or Non Integral Prime Basis Position Number of its smallest element.*

This will be illustrated by an Example.

Example 5

Considering the Set

$$S = \left\{ 2, 5, 6, 7, 11, 14, 15, 17, 21, 23, 26, 29, 30, 31, \right. \\ \left. 35, 39, 41, 45, 70, 84, 102, 110, 130, 210, 482, 1155 \right\}$$

Using the method of One Step Evolution detailed in R. C. Bagadi [1], we note that

$$PLT1 = \{2, 5, 11, 17, 23, 31\} \text{ Period} = 2$$

$$PLT2 = \{2, 17, 17, 29, 41\} \text{ Period} = 3$$

$$PLT3 = \{6, 14, 21, 26, 35, 39\} \text{ Period} = 2$$

$$PLT4 = \{6, 15, 26, 35, 45\} \text{ Period} = 3$$

$$PLT5 = \{30, 70, 102, 110, 130\} \text{ Period} = 2$$

$$PLT6 = \{30, 84, 110\} \text{ Period} = 3$$

$$PLT7 = \{210, 482, 1155\} \text{ Period} = 2$$

Here, by Period, we mean the number of times One Step Evolution has to be applied successively on any element (other than the last element of this Sequence) of this Prime Like Trend Sequence to reach to its next element in the aforementioned Sequence.

This set of Sets can also be called as the *Primality Tree Set* of the Set S.

Similarly, also, we can find all the Non Intersecting Prime Like Trends of a given Set S. Here, we prevent repeating of any element of the Set S in any other Prime Like Trend of the Set S, if it has already occurred in any one Prime Like Trend of the Set S. Then such Prime Like Trends can be called as *Unique Prime Like Trends* of a given Set S.

When the Elements of S are Positive Reals, we can make close approximation of each Positive Real as a Rational Number and can take the LCM (Lowest Common Multiple) of the Denominators, and now the Numerator term is the Set of the sequence elements numerators (after the sequence S elements are rendered as set of rationals) each correspondingly multiplied by the ratio of the aforementioned LCM to the corresponding respective sequence elements denominator. Now, we find all the Prime Like Trend Sequences for the Numerator Set and we finally divide these elements each by the LCM value to get the Final Prime Like Trends. A seasoned reader of author's works would not find this task formidable at all.

Important Note: For computing Prime Like Trends or Unique Prime Like Trends, firstly, any given Set should be decomposed into two or more Sets, Monotonically

Increasing Sets and Monotonically Decreasing Sets, while also those Increasing or Decreasing Sets elements conform to the along time nature of the Time Line. Now, from these sets, one can start evaluating the Unique Prime Like Trends.

The author gratefully and graciously names such Prime Like Trends Of Any Set Of Positive Reals as 'The Ananda-Damayanthi-Radha-RobithRishi Sequence Trends Of Any Set Of Positive Real Numbers, named after his loving Father, Mother, Wife and Son.

Example 6

Picking A Sample With Minimum Bias

Given a Set of Numbers, we first, slate all those numbers as Primes of some Higher Order, say R Sequence of Primes, i.e., their Prime Basis Position Numbers in this Order Of Sequence Of Primes may be Positive Integers or Positive Reals.

We now find all the Prime Like Trends constituting these set of numbers. Now, from every Prime Like Trend, we pick the Central Value (in case the number of elements in the Prime Like Trend of concern are odd), or we pick both the Central Values (in case the number of elements in the Prime Like Trend of concern are even) as the Sample Values for the given Set of Numbers. This Sample forms the Sample with Least Possible Bias. Also, if more number of elements can be chosen, we can also choose both the beginning element and the end element of each of the Prime Like Trend of concern as additional Sample Values. Now, this Complete Sub-Set of Values of the given Set of Numbers can be considered as the Sample Gotten With Least Possible Bias.

The Case Of Distilling A Prime Like Trend Into Evolving (Monotonically Increasing) & Devolving (Monotonically Decreasing) Sequences

In some instances when we find the Prime Like Trends of a given Set wherein each Prime Like Trend has some distinct or non-distinct Periodicity, and if these are not either monotonically increasing or monotonically decreasing, we can distill this Prime Like Trend into a Monotonically Increasing Sequence and a Monotonically Decreasing Sequence, each of which are considered for finding their Monotonically Increasing and Monotonically Decreasing Prime Like Trends respectively.

The Case Of Prime Like Trends With Their Periodicity Increasing According To The Sequence Of Primes Or Any Higher Real Order Sequence Of Primes Or Any Higher Real Order Lateral Sequence Of Primes, In The Onward Or Reverse Order

One can also note that for any given Set The Case Of Prime Like Trends With Their Periodicity Increasing According To The Sequence Of Primes Or Any Higher Real Order Sequence Of Primes Or Any Higher Real Order Lateral Sequence Of Primes, and their Linear Combinations can be considered for evaluation and can be used to explain Ever Increasing Entropy Dynamics and also Exponentially Growing Multi-Body Interaction Parameter Dynamics.

The Schema and Construction and Optimization of such aforementioned Prime Like Trends with Monotonically Increasing Variable Periodicity or Monotonically Decreasing Variable Periodicity According To The Sequence Of Primes Or Any Higher Real Order Sequence Of Primes Or Any Higher Real Order Lateral Sequence Of Primes, will be presented by the author in detail in the author's upcoming Fourth Edition of this title.

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6 THEORY OF ONE STEP EVOLUTION OF ANY POSITIVE REAL NUMBER

One Step Universal Evolution Of Any Real Positive Integer [1]

One can note that any Natural Number 's' can be written as

$s = (p_1)^{a_1} \cdot (p_2)^{a_2} \cdot (p_3)^{a_3} \cdot \dots \cdot (p_{z-1})^{a_{z-1}} \cdot (p_z)^{a_z}$ where $p_1, p_2, p_3, \dots, p_{z-1}, p_z$ are some Primes and $a_1, a_2, a_3, \dots, a_{z-1}, a_z$ are some positive integers.

We can write it further as

$$s = \overbrace{(p_1)(p_1) \dots (p_1)}^{a_1 \text{ number of times}} \cdot \overbrace{(p_2)(p_2) \dots (p_2)}^{a_2 \text{ number of times}} \cdot \overbrace{(p_3)(p_3) \dots (p_3)}^{a_3 \text{ number of times}} \cdot \dots \cdot \overbrace{(p_{z-1})(p_{z-1}) \dots (p_{z-1})}^{a_{z-1} \text{ number of times}} \cdot \overbrace{(p_z)(p_z) \dots (p_z)}^{a_z \text{ number of times}}$$

We can write the above as

$$s = (p_1)(p_1)^{(a_1-1)} \cdot (p_2)(p_2)^{(a_2-1)} \cdot (p_3)(p_3)^{(a_3-1)} \cdot \dots \cdot (p_{z-1})(p_{z-1})^{(a_{z-1}-1)} \cdot (p_z)(p_z)^{(a_z-1)}$$

Method 1:

We now consider One Step Evolution of any one factor, say p_1 or p_2 or p_3 or or p_{z-1} or p_z (among their $a_1, a_2, a_3, \dots, a_{z-1}, a_z$ number of occurrences respectively such that the increase in s is minimal. By One Step Evolution of p_j , we mean, if p_j is the j^{th} Prime number then we consider the $(j+1)^{\text{th}}$ Prime number as the One Step Evolved version of p_j . This will be illustrated by way of an Example.

Example 7

$$s = 40,500 = (2)^2 \cdot (3)^4 \cdot (5)^3$$

which can be written as

$$s = 40,500 = 2(2)^{2-1} \cdot 3(3)^{4-1} \cdot 5(5)^{3-1}$$

Case 1: Now, considering One Step Evolution of 2 (of the one outside the brackets), we have

$$s = 3.(2)^1.3(3)^3 \cdot 5(5)^2 = 60,750$$

Case 2: Now, considering One Step Evolution of 3 (of the one outside the brackets), we have

$$s = 2.(2)^1.5(3)^3 \cdot 5(5)^2 = 60,750$$

Case 3: Now, considering One Step Evolution of 5 (of the one outside the brackets), we have

$$s = 2.(2)^1.3(3)^3 \cdot 7(5)^2 = 60,750$$

Therefore, One Step Evolution of 40,500 is 56,700 as the aforementioned increase is Minimal in Case 3.

In this fashion, we can Evolve any given Positive Natural Number. We

can note that any Positive Real Number can be written as $\frac{c}{d}$ where c and d are some Positive Natural Numbers. Therefore, we can note that

$$E^1\left\{\frac{c}{d}\right\} = \frac{E^1(c)}{E^1(d)} \quad \text{where } c \text{ and } d \text{ are some Positive Numbers and}$$

E^1 represents the One Step Evolution Operator.

Method 2:

In this method we consider the Generalized Model For Estimation Of The Next Prime Given A Sequence Of Primes Starting From The Beginning detailed in Chapter One, in predicting the next One Step Evolved value of a number given the number s and its One Step Evolved number $E^1(s)$ which can be gotten by using Method 1. Even if only s is given, we consider $(s + \delta_1)$ where $\delta_1 < E^2(s)$ is a Poisitive Number, we use the above prediction Method to find One Step Evolved value of $(s + \delta_1)$ and finally, we re-write the expression for $(s + \delta_1)$ recursively in terms of $\delta_1 = f\{s, (s + \delta_1), \delta_1\}$ and differentiate thusly

$$\frac{d\delta_1}{d\delta_1} = \frac{d}{d\delta_1} \{f\{s, (s + \delta_1), \delta_1\}\} = 0 \quad \text{and solve for } \delta_1. \text{ This } \delta_1 \text{ must be a}$$

$$\text{minimum, i.e., } \frac{d^2\delta_1}{d\delta_1^2} = \frac{d^2}{d\delta_1^2} \{f\{s, (s + \delta_1), \delta_1\}\} < 0$$

Method 3 :

We find the Centroid of each of the following factors considering their repeating instances as well, shown below, in Prime Basis (see Chapter 8) and evolve it using the appropriately applicable methods of One Step Evolution detailed already.

$$s = \overbrace{(p_1)(p_1) \dots (p_1)}^{a_1 \text{ number of factors}} \cdot \overbrace{(p_2)(p_2) \dots (p_2)}^{a_2 \text{ number of factors}} \cdot \overbrace{(p_3)(p_3) \dots (p_3)}^{a_3 \text{ number of factors}} \cdot \dots \cdot \dots \cdot \overbrace{(p_{(z-1)})(p_{(z-1)}) \dots (p_{(z-1)})}^{a_{z-1} \text{ number of factors}} \cdot \overbrace{(p_1)(p_1) \dots (p_1)}^{a_z \text{ number of factors}}$$

Method 4:

We can also use authors notions of *Optimal Relative Importance Index* detailed in the next section to design Evolution Strategies using this concept, wherein we ascribe weightages of Relative Importance Index to factor(s) that is(are) to be evolved.

Considering the following,

$$s = \overbrace{(p_1)(p_1) \dots (p_1)}^{a_1 \text{ number of factors}} \cdot \overbrace{(p_2)(p_2) \dots (p_2)}^{a_2 \text{ number of factors}} \cdot \overbrace{(p_3)(p_3) \dots (p_3)}^{a_3 \text{ number of factors}} \cdot \dots \cdot \dots \cdot \overbrace{(p_{(z-1)})(p_{(z-1)}) \dots (p_{(z-1)})}^{a_{z-1} \text{ number of factors}} \cdot \overbrace{(p_1)(p_1) \dots (p_1)}^{a_z \text{ number of factors}}$$

We write the above as

$$s = \prod_{i=1}^z \{(p_i)^{a_i \{ORII(a_i)\}}\} \{ORII(p_i)\}$$

where ORRI stands for *Optimal Relative Importance Index* detailed in Chapter 8:

We now consider One Step Evolution Method as detailed by some of the appropriately and analogously applicable One Step Evolution methods detailed above.

Relative Importance Index

For a given Set of values $S = \{s_i\}_{i=1 \text{ to } n}$ denoting the Relative Importance Indexes for some n number of distinct aspects of concern. We first arrange them in an ascending order. We then find $s_i(\text{Max})$ and $s_i(\text{Min})$. We, then define the Relative Importance Index for s_i as

$$RI(s_i) = \left\{ \frac{s_i - s_i(\text{Min})}{s_i(\text{Max}) - s_i(\text{Min})} \right\}$$

Optimal Relative Importance Index

Method 1

We now find Relative Importance Indices for each element relative to every element as well,

Case 1:

$$RI(s_{ij}) = \left\{ \frac{\left(\frac{s_i - s_j}{s_i(\text{Max}) - s_j} \right)}{\text{Max} \left(\frac{s_i - s_j}{s_i(\text{Max}) - s_j} \right)} \right\} \text{ for } i, j = 1 \text{ to } n$$

Case 2:

$$RI(s_{ij}) = \left\{ \frac{\left(\frac{s_i - s_{\text{avg}}}{s_{\text{avg}} - s_j} \right)}{\text{Max} \left(\frac{s_i - s_{\text{avg}}}{s_{\text{avg}} - s_j} \right)} \right\} \text{ for } i, j = 1 \text{ to } n$$

Case 3:

$$RI(s_{ij}) = \left\{ \frac{\left(\frac{s_i - s_i(\text{Min})}{s_j} \right)}{\text{Max} \left(\frac{s_i - s_i(\text{Min})}{s_j} \right)} \right\} \text{ for } i, j = 1 \text{ to } n$$

We can note that the $RI(s_{ij})$ is a Matrix of size $n \times n$ in which every row has 1 in it, just that this 1 keeps shifting by one position in the every next row. We now choose that particular row, whose sum of the row elements is Maximum, say this row be the p^{th} row. Similarly, we now choose that particular column, whose sum of the Column elements is Maximum, say this Column be the q^{th} row. We can then use $RI(s_{pj})$, $RI(s_{iq})$ or $\left\{ \frac{RI(s_{pj}) + RI(s_{iq})}{2} \right\}$ as the value of Optimal Relative

Importance Index for the definitions slated above.

Method 2

Case 1:

In this method, the above 3 cases hold good and we define the value of Optimal Relative Importance Index $RI(s_{i(j=r)})$ (i.e., for that particular column r) for which the value

$V_C = \text{Max}\{RI(s_{ij})_{i,j=1 \text{ to } n}\} - \text{Min}\{RI(s_{ij})_{i,j=1 \text{ to } n}\}$ is Maximum for some $1 \leq r \leq n$.

Case 2:

In this method, the above 3 cases hold good and we define the value of Optimal Relative Importance Index $RI(s_{(i=s)j})$ (i.e., for that particular row i) for which the value

$V_R = \text{Max}\{RI(s_{ij})_{i,j=1 \text{ to } n}\} - \text{Min}\{RI(s_{ij})_{i,j=1 \text{ to } n}\}$ is Maximum for some $1 \leq i \leq n$.

Case 3:

Here, we take the Optimal Relative Importance Index $RI(s_{ij})$ as the average of $RI(s_{i(j=r)})$ and $RI(s_{(i=s)j})$.

One Step Universal Devolution Of Any Real Positive Integer [1]

One can note that One Step Devolution process is just the inverse or reverse process of One Step Evolution. This has been clearly mentioned

in the author's research works at the web links detailed in the references [1] and [2].

One can detail One Step Devolution as follows:

One can note that any Natural Number 's' can be written as

$s = (p_1)^{a_1} \cdot (p_2)^{a_2} \cdot (p_3)^{a_3} \cdot \dots \cdot (p_{z-1})^{a_{z-1}} \cdot (p_z)^{a_z}$ where $p_1, p_2, p_3, \dots, p_{z-1}, p_z$ are some Primes and $a_1, a_2, a_3, \dots, a_{z-1}, a_z$ are some positive integers.

We can write it further as

$$s = \overbrace{(p_1)(p_1) \dots (p_1)}^{a_1 \text{ number of times}} \cdot \overbrace{(p_2)(p_2) \dots (p_2)}^{a_2 \text{ number of times}} \cdot \overbrace{(p_3)(p_3) \dots (p_3)}^{a_3 \text{ number of times}} \cdot \dots \cdot \overbrace{(p_{z-1})(p_{z-1}) \dots (p_{z-1})}^{a_{z-1} \text{ number of times}} \cdot \overbrace{(p_z)(p_z) \dots (p_z)}^{a_z \text{ number of times}}$$

We can write the above as

$$s = (p_1)(p_1)^{(a_1-1)} \cdot (p_2)(p_2)^{(a_2-1)} \cdot (p_3)(p_3)^{(a_3-1)} \cdot \dots \cdot (p_{z-1})(p_{z-1})^{(a_{z-1}-1)} \cdot (p_z)(p_z)^{(a_z-1)}$$

Method 1:

We now consider One Step Devolution of any one factor, say p_1 or p_2 or p_3 or or p_{z-1} or p_z (among their $a_1, a_2, a_3, \dots, a_{z-1}, a_z$ number of occurrences respectively such that the decrease in s is minimal. By One Step Devolution of p_j , we mean, if p_j is the j^{th} Prime number then we consider the $(j-1)^{\text{th}}$ Prime number as the One Step Evolved version of p_j . This will be illustrated by way of an Example.

Example 7

$$s = 40,500 = (2)^2 \cdot (3)^4 \cdot (5)^3$$

which can be written as

$$s = 40,500 = 2(2)^{2-1} \cdot 3(3)^{4-1} \cdot 5(5)^{3-1}$$

Case 1: Now, considering One Step Devolution of 2 (of the one outside the brackets), we have

$$s = 1.(2)^1.3(3)^3 \cdot 5(5)^2 = 20,250$$

Case 2: Now, considering One Step Devolution of 3 (of the one outside the brackets), we have

$$s = 2.(2)^1.1(3)^3 \cdot 5(5)^2 = 13,500$$

Case 3: Now, considering One Step Devolution of 5 (of the one outside the brackets), we have

$$s = 2.(2)^1.3(3)^3 \cdot 3(5)^2 = 24,300$$

Therefore, One Step Evolution of 40,500 is 24,300 as the aforementioned increase is Minimal in Case 3.

In this fashion, we can Devolve any given Positive Natural Number. We

can note that any Positive Real Rational Number can be written as $\frac{c}{d}$

where c and d are some Positive Natural Numbers. Therefore, we

can note that $E^{-1}\left\{\frac{c}{d}\right\} = \frac{E^{-1}(c)}{E^{-1}(d)}$ where c and d are some Positive

Integer Numbers and E^{-1} represents the One Step Devolution Operator.

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7 REPRESENTATION OF THE FIELD OF POSITIVE REALS AS THE SET OF SEQUENCES OF PRIMES, HIGHER ORDER PRIMES AND ASKEW HIGHER ORDER PRIMES

Askew Higher Order Primes

One can note from the previous Chapters that, so far we have the Standard Sequence of Primes, and Higher Order Sequence Of Primes. Any other positive integer number ‘s’ can be decomposed into the product of primes, each raised to some positive integer as shown below:

$s = (p_1)^{a_1} \cdot (p_2)^{a_2} \cdot (p_3)^{a_3} \cdot \dots \cdot (p_{z-1})^{a_{z-1}} \cdot (p_z)^{a_z}$ where $p_1, p_2, p_3, \dots, p_{z-1}, p_z$ are some Primes and $a_1, a_2, a_3, \dots, a_{z-1}, a_z$ are some positive integers where preferably $p_i < p_{i+1}$ for $i = 1$ to z

We can write it further as

$$s = \overbrace{(p_1)(p_1) \dots (p_1)}^{a_1 \text{ number of times}} \cdot \overbrace{(p_2)(p_2) \dots (p_2)}^{a_2 \text{ number of times}} \cdot \overbrace{(p_3)(p_3) \dots (p_3)}^{a_3 \text{ number of times}} \cdot \dots \cdot \overbrace{(p_{z-1})(p_{z-1}) \dots (p_{z-1})}^{a_{z-1} \text{ number of times}} \cdot \overbrace{(p_z)(p_z) \dots (p_z)}^{a_z \text{ number of times}}$$

We now apply *One Step Evolution Operator* on s to find its next number along the Sequence characterized by the Consecutive and Consecutive One Step Evolution of the number s up to some high value number limit. We similarly, keep applying the One Step Evolution Operator on its thusly generated values to find the entire Sequence upwards. Similarly, we now apply *One Step Devolution Operator* on s to find its previous number along the Sequence characterized by the Consecutive and Consecutive One Step Devolution of the number s up to some a number value limit beyond which it cannot be devolved. We keep applying the One Step Devolution Operator on its thusly generated values to find the entire Sequence downwards up to some a number value limit beyond which it cannot be devolved. The Union of the two Sets of s , namely, the upwards Evolved Consecutively for One Step up to some high value number limit and downwards Devolved Consecutively for One Step up to a number value limit beyond which it

cannot be devolved, can be called as the *Askew Higher Order Sequence Of Primes Of the number s*.

Therefore, all the three kind of Sequences, namely The Standard Sequences of Primes, The Higher Order Sequences Of Primes and The Askew Order Sequences of Primes cover the entire Range of Positive Integers.

Representation For Rational Numbers

One can note that if we consider any Rational Number of the form $\frac{a}{b}$ where a and b , are Positive Integers, we can note that the One Step Evolution of $\frac{a}{b}$ is given by $E^1\left(\frac{a}{b}\right) = \frac{E^1(a)}{E^1(b)}$ where $E^1(\)$ represents the One Step Evolution Operator. And similarly, One Step Devolution of $\frac{a}{b}$ is given by $E^{-1}\left(\frac{a}{b}\right) = \frac{E^{-1}(a)}{E^{-1}(b)}$ where $E^{-1}(\)$ represents the One Step Devolution Operator.

Therefore, the Sequence to which any Rational Number R_n belongs can be gotten by the Union of

- a) Consecutive & Continuous One Step Evolution of R_n up to some high value number limit considered for analysis.
- b) Consecutive & Continuous One Step Devolution of R_n up to some a number value limit beyond which it cannot be devolved.

Representation For Irrational Numbers

One can note that if we consider any Irrational Number of the form $\frac{c}{d}$

where c and d are Positive Integers, we can note that

we can write $\frac{c}{d}$ as

$$\frac{c}{d} = \frac{c_1}{d_1} + \lambda_1$$

where c_1 and d_1 are Positive Integers and λ_1 his a Lowest Possible Real Positive Number Value.

Similarly, we again write

$$\lambda_1 = \frac{c_2}{d_2} + \lambda_2$$

where c_2 and d_2 are Positive Integers and λ_2 is a Lowest Possible Real Positive Number Value.

We keep repeating this procedure till we have λ_t say, at the t^{th} step as negligible or tending to zero. That is, we write $\frac{c}{d}$ as

$$\frac{c}{d} = \sum_{i=1}^t \left(\frac{c_i}{d_i} \right) + \lim_{\lambda_t \rightarrow 0} (\lambda_t)$$

Therefore, One Step Evolution of $\frac{c}{d}$ is given by

$$E^1 \left(\frac{\text{NumeratorOf} \left\{ \sum_{i=1}^t \left(\frac{c_i}{d_i} \right) \right\}}{\text{DenominatorOf} \left\{ \sum_{i=1}^t \left(\frac{c_i}{d_i} \right) \right\}} \right) \text{ where } E^1() \text{ represents the One}$$

Step Evolution Operator. Therefore, One Step Devolution of $\frac{c}{d}$ is

$$\text{given by } E^{-1} \left(\frac{\text{NumeratorOf} \left\{ \sum_{i=1}^t \left(\frac{c_i}{d_i} \right) \right\}}{\text{DenominatorOf} \left\{ \sum_{i=1}^t \left(\frac{c_i}{d_i} \right) \right\}} \right) \text{ where } E^{-1}() \text{ represents}$$

the One Step Devolution Operator.

Therefore, the Sequence to which any Irrational Number I_n belongs can be gotten by the Union of

- c) Consecutive & Continuous One Step Evolution of I_n up to some high value number limit considered for analysis.
- d) Consecutive & Continuous One Step Devolution of I_n up to some a number value limit beyond which it cannot be devolved.

Representation Of Negative Real Numbers

Any Real Negative Number can be represented in the same fashion as detailed above by the above detailed methods, only that we put a negative sign before the representation.

8 NATURAL REPRESENTATION SCHEME

Primes As Counting Bases

As Primes are unique in the sense that they cannot be factorized as a product of other positive integers other than themselves and 1, we can note that these are unique bases provided to us by the nature to explain every countable phenomena using these bases.

Therefore, then, any positive integer should be expressible as a sum of Primes, with possible repetition of some or all bases. For Example,

Example 8

$$27=1+2+3+5+7+(9)$$

which can further be written as

$$27=1+2+3+5+7+$$

$$1+2+3+0+0+$$

$$1+2+0+0+0 \quad \text{i.e.,}$$

$$27 = 3|1\rangle + 3|2\rangle + 2|3\rangle + 1|5\rangle + 1|7\rangle$$

where, $|1\rangle, |2\rangle, |3\rangle, |5\rangle, |7\rangle$ are representations for the Prime Bases namely 1, 2, 3, 5, 7.

The Matrix $\begin{bmatrix} 1 & 2 & 3 & 5 & 7 \\ 1 & 2 & 3 & 0 & 0 \\ 1 & 2 & 0 & 0 & 0 \end{bmatrix}$ can be thought of as *Primality Matrix* or

Primality Tree Matrix for the Number 27, denoted as PTM_{27} .

Therefore, it can be noted that every Positive Integer z is a (*Discrete*) *Function*, actually a 2 Variable Function where each Variable takes the values of the Sets $V_r = \{1, 2, 3, \dots, m_{(z-1)}, m_z\}$ and $V_c = \{1, 2, 3, \dots, n_{(z-1)}, n_z\}$ with $f(V_r, V_c) = \{PTM_z(V_r, V_c)\}$ spanning $\begin{matrix} V_r=1 \text{ to } m_z \\ V_c=1 \text{ to } n_z \end{matrix}$

the dimensions of the *Primality Tree Matrix* PTM_z where m_z is the number of Rows of PTM_z and n_z is the number of Columns of PTM_z

It should be noted that in the construction of the aforesaid Primality Tree Matrix, the decomposition of the residue after each step of decomposition as detailed, should be such that, in every row of it, the values should be consecutive Primes starting from 1 along the column numbers, i.e., they should be in ascension as dictated by the Sequence of Primes starting from 1, and this how any Residue is to be computed for any further decompositions, as said.

For this Example, it can be noted that the First Residue after the aforesaid type of decomposition shown in the first row of the above matrix is 9, and the Second Residue after the aforesaid type of decomposition shown in the second row of the above matrix is 3 and the Third Residue after the aforesaid type of decomposition shown in the third row of the above matrix is 0. We stop building the Primality Tree Matrix further, when the Residue comes to a zero value.

And the Set Representation for the Positive Integer 27 as

$S_1 : 27 \equiv \{(3,1), (3,2), (2,3), (1,5), (1,7)\}$ can be called as *Primality Set Function* for the Number 27.

That is, any positive integer z can be written as

$$z = \sum_{j=1}^{n_z} \sum_{i=1}^{m_z} a_{ij} |p_j\rangle$$

where m_z is the number of Rows of PTM_z and n_z is the number of Columns of PTM_z and $p_j = j^{th}$ Prime Starting from 1

And, $a_{ij} = PMT_z(i, j)$

Here, we need to consider 1 as also Prime as otherwise, the representation will have some exceptions, and the theory will not advantageously close.

Though, it can be noted that usual laws of algebra, of Addition, Subtraction hold good, the most important thing is the fact that, at least 3 or more Functions or Sets representing the above operation as show below, wherein each Set in the following example can be detailed as follows:

$$27+4=31$$

$$27 = 3|1\rangle + 3|2\rangle + 2|3\rangle + 1|5\rangle + 1|7\rangle$$

$$4 = 2|1\rangle + 1|2\rangle$$

$$27 + 4 = (3 + 2)|1\rangle + (3 + 1)|2\rangle + 2|3\rangle + 1|5\rangle + 1|7\rangle$$

$$27 + 4 = 5|1\rangle + 4|2\rangle + 2|3\rangle + 1|5\rangle + 1|7\rangle$$

Now, we write the 3 Sets (or Functions) as follows:

$$S_1 : 27 \equiv \{(3,1), (3,2), (2,3), (1,5), (1,7)\}$$

$$S_2 : 4 \equiv \{(2,1), (1,2)\}$$

$$S_1 + S_2 : 31 \equiv \{(5,1), (4,2), (2,3), (1,5), (1,7)\}$$

wherein the first co-ordinate represents the Prime Basis Co-efficient in the aforementioned representation scheme for a given positive integer and the second co-ordinate represents the Prime Basis Number itself.

Therefore, it can be noted in this schema that, every positive integer is indeed a Function on 2 Sets.

Furthermore, the use of the Prime Basis Position Number Bases as Polyads actually represents the Higher Order Sequences of Primes. Only thing is, there are certain Restrictions to this kind of Representation, them essentially being

- a) The k number of Distinct Prime Bases used to form a Polyadic Primes Base for each term should be the same throughout every term in such representation, wherein such a Polyadic Primes Basis is simply formed by multiplication of the k number of Distinct Primes Basis.
- b) The Sequence of Higher Order Primes of $(k+1)^{th}$ Order Space governs the Order and Succession of the Polyadic Primes Basis, according to the increasing order of the value of the product of such bases of a term. However, if a particular base is missing, the coefficient of zero must be used, this is recommended as we also keep track of Prime Basis Position Number of the corresponding Higher Order Sequence Of Primes acting as a Polyadic Base. We call the Sequence to be belonging to the Space of $(k+1)^{th}$ Order as it is Prime in the $(k+1)$ dimensions, i.e., we cannot further factorize to form the extra factor.

Therefore, in this case, the representation would be

$$z = \sum_{j=1}^{n_z} \sum_{i=1}^{m_z} b_{ij} \left\{ \prod_{\substack{t \in \{\phi_j\} \\ |t|=k}} |p_{j_t}\rangle \right\}$$

where $|t| = k$ is the Cardinality of the Set $\{\phi_j\}$

and $b_{ij} = PMT_z(i, j)$

Therefore, in a Polyadic Prime Basis Representation Schema, any Positive Integer is actually m_z number of Sets of n_z number of co-ordinates, each of k dimensions, where each of the k dimensional Polyadic base is gotten by finding all the possible Permutations of Placements of all the Prime Bases considered from $|p_1\rangle = |1\rangle$ up to say, $|p_T\rangle$, considering k number of them at a time in forming each Polyadic Term. We now arrange all these Polyadic Bases in an increasing order as dictated by the Product value of their bases therein. This also forms the Sequence Of Primes Of Order $(k+1)$ considered up to the value of $|p_{T-2}\rangle |p_{T-1}\rangle |p_T\rangle$ which is simply the product of $p_{(T-2)}p_{T-1}p_T$. This kind of representation of every Positive Integer as the Most Optimal Function and can be considered as the Basis for Natural Representation Theory.

Therefore, it can be noted that every Positive Integer z is a (*Discrete*) *Function*, actually a $(k+1+1)$ Variable Function where each Variable takes the values of the Sets $V_r = \{1, 2, 3, \dots, m_{(z-1)}, m_z\}$ and $V_c = \{1, 2, 3, \dots, n_{(z-1)}, n_z\}$ with $f(\chi(1), \chi(2), \chi(3), \dots, \chi(k-1), \chi(k), V_r, V_c) =$

$$\left\{PTM_z(\chi(1), \chi(2), \chi(3), \dots, \chi(k-1), \chi(k), V_r, V_c)\right\}$$

 spanning the dimensions of the *Primality Tree Matrix* PTM_z where m_z is the number of Rows of PTM_z and n_z is the number of Columns of PTM_z . Here, we have used $\chi(i)$ with $i=1$ to k to denote the k number of variables.

That is, the vector

$\bar{k} = [\chi(1), \chi(2), \chi(3), \dots, \chi(k-1), \chi(k)]$ denotes the various factors of any Polyadic Base Term of k factors. If we consider only k number of factors to represent any Polyadic Base Term, we would have at most $n_z = k!$ and this sets the minimum possible value of value of T and the value $|p_{T-2}\rangle |p_{T-1}\rangle |p_T\rangle$ itself. It should be clearly understood that Polyadic Base Representations wherein only k number of factors are used to represent any Polyadic Base Term can only represent a Sub-Set

of all the Positive Integers. However, as we keep increasing the value of k , the situations gets better, but then again, it also depends on the spacing between the Primes for High values of Primes.

Therefore, Polyadic Base Representation can be only used as a Statistical Scheme for statistically solving the problems of Big Data, such as Information Condensation, Data Retrieval, Memory Sectorizing etc., or the likes when they can be grouped into desired domains as Polyadic Bases appropriately.

The other parallel Single Prime Base Scheme detailed is however holistic and can cover the entire span of Positive Integers, thus finding its use greatly in design of Tailor Made Representation Systems to solve any representation problem of concern.

Natural Universal Curves Representing Any Positive Number

Furthermore, it can be noted that when the co-ordinates of any Positive Integer represented in the aforementioned *Primality Tree Matrix* fashion are plotted in Spatially, in some Optimum Number of Dimensions, say $(k+1+1)$ dimensions, where the first term in the sum term of $(k+1+1)$ accomodates for the variable k , and the second term in the sum term of $(k+1+1)$ accomodates for the variable m_z and finally, the third term in the sum term of $(k+1+1)$ accomodates for the variable n_z , for a given k , which is the Number of Distinct Primes as Bases in each term of the aforementioned Polyadic Representation, we get Natural Universal Curve(s) that represent any Positive Integer of concern, based on the value of k used. Therefore, recursively speaking, any R-Dimensional Set, i.e., a R-Curvly Figure represents just a Number ! This is the way, the grand Universe represents its aspects in terms of just Numbers ! Therefore, we can now find the necessary Transforms connecting two Sets whose such Natural Universal Curve(s) at the Maximal value of k , are known. If these two aspects under comparison are differing in dimensions, i.e., the n_z value, we consider the use of the Higher n_z value (Dimension) for this type of analysis.

As a matter of fact, an Optimal Representation Scheme parameters such as T and k might exist for any Number z when we wish to Represent them in Polyadic Primes Basis.

It can be noted that this concept can be advantageously used for the application of author's "Universe's Similarities Accretion Principle" for the successful characterization of Aspect Existence State Potential and also interestingly, the difference between any two Aspects Existence State Potentials which is proportional to the difference between the two Numbers representing the two Aspects.

The Universe's Similarities Accretion Principle says that *All Similar Things Are The Same Upto The Degree Of Their Congruence*. This is a way of the Universe for compactly representing or storing Similar Perceptions. Therefore, even for ever alphabet, we can have Natural Universal Curves for a given Size and the Sets concerning them.

Also, it can be noted that the Phonetic Sounds of Alphabets are Time Dependent Functions of Relative Intensity Of Decibels (or Electric Time Dependent Voltage Functions, in Electric basis) which again are Natural Universal Curves that vary with Time which again have concerned Sets that also vary with Time and such Sets are constructed as already detailed.

In a similar fashion, we can explain 3-Dimensional Videos or/ and 3-Dimensional Aspects and if they are Time Dependent, 3-Dimensional Aspect Dynamics. In a similar fashion, we can explain 2-Dimensional Pictures, aspects etc.

Furthermore, after slating such Sets and Natural Universal Curves for each and every alphabet for a unit size, we can similarly construct such Sets and Natural Universal Curves for Words as Phonetic Sound Functions (or Time Dependent Functions Of Phonetic Voltages, in the electric Basis.

Finding the Complement Of Any Number Or Set

Using the theory detailed in the above section to find the set of natural curves representing any number of concern and its Primality Matrix, we can now find the a) Mirror Images b) Inverses c) Complements d) Orthogonals of these Natural Curves algebraically using the theory of functions, and hence can find the numbers and their Primalty Matrices that are a) Mirror Images b) Inverses c) Complements of the afore-considered numbers and their Primality Matrices.

Representation For Decimal Numbers

As any decimal number can be represented as follows:

$$0 \cdot (x_1)(x_2)(x_3).....(x_{(l-1)})(x_l)$$

we can write it simply as

$$\left(\frac{x_1 x_2 x_3 x_{(l-1)} x_l}{10^l} \right)$$

We now find Primes Basis Representations for both $x_1 x_2 x_3 x_{(l-1)} x_l$ and also 10^l

The division of such Primes Basis (Polyadic) Vectors is detailed as follows:

Only terms with same Polyadic Bases in each Vector can be divided, and the division would be the division of the Polyadic Bases co-efficients.

Representation For Irrational Numbers

For some irrational numbers which cannot be expressed as the ratio of

two integers $\left(\frac{a_1}{a_2} \right)$, we can write them as

$$\text{Irrational Number } I_n = \left(\frac{a_1}{a_2} \right) + \left(\frac{\delta_1}{\delta_2} \right)$$

where a_1, a_2, δ_1 and δ_2 are all Positive Integers.

Using the method detailed in the previous section, we can find the Primes Basis Representation for each of the division terms (as many as there can be) and then simply find the sum of such Primes Basis Representations for such division terms, Vector or Polyad component wise, i.e., Primes Bases wise.

Therefore, now any Positive Real Number can be represented in the Primes Basis.

Example 9

Representation Of The Space Time As An Infinite Dimensional System

The author surmises that Space Time is of infinite dimensions and Prime Numbers are the bases in which we measure along each dimension. That is, the metric along each dimension is along the

sequence of Primes with periodicity equal to the number of dimensions of Space-Time we choose to represent it. The higher this number, the better is our representation of the system of concern.

Say, if we are noticing Space in say $D=5$ dimensions, we have the co-ordinate system scales as follows:

D=1	D=2	D=3	D=4	D=5
1	2	3	5	7
11	13	17	19	23
29	31	37	41	43
47	53	59	61	67
71	73	79	83	87
.
.
.

Therefore, we can note that when we consider only 5 dimensions of Space Time for noticing any aspect of concern, we have the co-ordinates along the first dimension as those given in the first column of the above table, the co-ordinates along the second dimension as those given in the second column of the above table, the co-ordinates along the third dimension as those given in the third column of the above table, the co-ordinates along the fourth dimension as those given in the fourth column of the above table and finally the co-ordinates along the fifth dimension as those given in the fifth column of the above table.

For characterization of Life Systems, we need to use a very high value of D , (the number of dimensions of Space Time considered for representation of the Life Aspect system of concern) enough big that all the Life Systems' genetic attributes are characterized exhaustively.

8 MATHEMATICAL CONSTRUCTS FOR NATURAL REPRESENTATION THEORY - 1

Addition and Subtraction Of Primality Tree Matrices Of A Given Positive Numbers z_1 and z_2

If the size of the Primality Tree PTM_{z_1} is $m_{z_1} \times n_{z_1}$ and the size of the Primality Tree PTM_{z_2} is $m_{z_2} \times n_{z_2}$, we pick the larger of (m_{z_i}, n_{z_i}) for $i = 1, 2$ and augment the Primality Tree Matrices of z_1 and z_2 of sizes $m_{z_1} \times n_{z_1}$ and $m_{z_2} \times n_{z_2}$ to a common size of $\{Max(m_{z_1}, m_{z_2})\} \times \{Max(n_{z_1}, n_{z_2})\}$ and we insert zeroes in the places of positions that are vacant when we write each of the aforementioned Primality Tree Matrices in this new augmented fashion.

Therefore when $APTM_{z_1 \{Max(m_{z_1}, m_{z_2})\} \times \{Max(n_{z_1}, n_{z_2})\}}$ and

$APTM_{z_2 \{Max(m_{z_1}, m_{z_2})\} \times \{Max(n_{z_1}, n_{z_2})\}}$ are the augmented matrices, then

$$APTM_{z_1 \{Max(m_{z_1}, m_{z_2})\} \times \{Max(n_{z_1}, n_{z_2})\}} \pm APTM_{z_1 \{Max(m_{z_1}, m_{z_2})\} \times \{Max(n_{z_1}, n_{z_2})\}} =$$

$$APTM_{z_1 \{Max(m_{z_1}, m_{z_2})\} \times \{Max(n_{z_1}, n_{z_2})\}}(i, j) \pm$$

$$APTM_{z_1 \{Max(m_{z_1}, m_{z_2})\} \times \{Max(n_{z_1}, n_{z_2})\}}(i, j)$$

where $i, j = 1$ to $\{Max(m_{z_1}, m_{z_2})\} \times \{Max(n_{z_1}, n_{z_2})\}$

Also, it should be noted that

$$APTM_{z_1 \{Max(m_{z_1}, m_{z_2})\} \times \{Max(n_{z_1}, n_{z_2})\}}(i, j) = PTM_{z_1}(i, j)$$

for $i = 1$ to m_{z_1} and $j = 1$ to n_{z_1} and

$$APTM_{z_1 \{Max(m_{z_1}, m_{z_2})\} \times \{Max(n_{z_1}, n_{z_2})\}}(i, j) = 0$$

in elsewhere locations when

$$m_{z_1} < i < Max(m_{z_1}, m_{z_2}) \text{ and}$$

$$n_{z_1} < j < Max(n_{z_1}, n_{z_2})$$

Finding The Primality Tree Matrix Of A Product Of Two Positive Numbers z_1 and z_2

In this case, we first multiply the numbers z_1 and z_2 and use this product value to construct the Primality Tree Matrix of a product of two Positive Numbers z_1 and z_2 .

The author will elucidate the topic of *Formal Theory of Algebra of Multiplication Of Any Two Primality Tree Matrices* in his upcoming next volume (2) for this title.

Example 10

Centroid of A Set Of Positive Real Numbers In Primes Basis

Given any n points, we first slate them in some Particular (Higher) Order of Sequence of Primes, i.e., as ${}^L p_j$ with $j=1 \text{ to } n$, may be a

Positive Integer or a Positive Fraction. We then find $\bar{x}_p = \left\{ \frac{\sum_{j=1}^n j}{n} \right\}$

and then find the Number Equivalent to ${}^L p_{\bar{x}_p}$ which is the Centroid of the given Set Of Real Numbers. One can refer to Chapter 4 and 5 for achieving such aforementioned setting.

Example 11

Computation Of A Representative Future Average For A Time Series Type Of Sequence Of Positive Real Numbers

Using the aforementioned One Step Evolution Scheme(s), we can also find the next value of ${}^N p_{\bar{x}_p}$ (referred to in the section on *Centroid of A Set Of Positive Real Numbers In Primes Basis*) which would be a Representative Future Average for this Set, if this were some kind of a Time Series Type Sequence.

The RL-Norm

For Normalization scheme, when we have to Normalize a Set of Real Numbers, we can use the concept of RL-Norm, i.e., normalization in the R Space where R is the Prime Basis Position Number in L^{th} Order Sequence Of Primes Representation of the Highest Value of the Set Of Real Numbers. For $L=2$, it reduces to Representation in Standard Sequences Of Primes Basis. That is, we can write the RL-Norm of a Set of Real Numbers

If, x_{1i} and x_{2i} are two n dimensional points, then

$$dist(RL\ Norm(x_{1i}, x_{2i})) = \left\{ \sum_{i=1}^n \left\{ (x_{1i} - x_{2i}) \right\}^{G_{PBP} \left\{ \left\{ \begin{matrix} Max(x_{1i}, x_{2i}) \\ \text{for all } i \end{matrix} \right\} \right\}} \right\} \right\} \left\{ \frac{1}{G_{PBP} \left\{ \left\{ \begin{matrix} Max(x_{1i}, x_{2i}) \\ \text{for all } i \end{matrix} \right\} \right\}} \right\}$$

Therefore, any RL-Norm type Normalization simply takes the form

$$RL\ Norm(x_i) = \frac{(x_i)}{\left\{ \sum_{i=1}^n \left\{ (x_i) \right\}^{G_{PBP} \left\{ \left\{ \begin{matrix} Max(x_i) \\ \text{for all } i \end{matrix} \right\} \right\}} \right\} \right\} \left\{ \frac{1}{G_{PBP} \left\{ \left\{ \begin{matrix} Max(x_i) \\ \text{for all } i \end{matrix} \right\} \right\}} \right\}}$$

Here, G_{PBP} is the Prime Basis Position Number of the greatest value of x_{1i} for the above formula and G_{PBP} is the Prime Basis Position Number of the greatest value of (x_{1i}, x_{2i}) for the formula above the above formula.

Computation Of Similarity Of Two Positive Integers Using RL-Norm (for G=2 case)

For, the aforesaid computation of Similarity of two positive integers, we first find their Primality Tree Matrices of the same and also appropriately augment them as detailed already to be to compare them. We then find the R value which is the Highest Value of the Set Of Real Numbers that constitute the afore-constructed Matrices. We now compute the RL Norm values of each element of the Matrix and then simply compute the Similarly between the two considered Positive Numbers as follows:

$$Similarity(z1, z2) = \sum_{j=1}^{Max(n_{z1}, n_{z2})} \sum_{i=1}^{Max(m_{z1}, m_{z2})} \left\{ \overbrace{PMT_{z1}(i, j)}^{PMT_{z1}(i, j)} \right\}$$

where, the $\widehat{PMT}_{z1}(i, j)$ indicates that every element of the matrix is RL-Normalized. And the same is implied for $\widehat{PMT}_{z2}(i, j)$

Here, we should use 1 as the First Prime we have already used it so in the constructing of Primality Tree Matrix of any Positive Integer, though we can use 2 as the First Prime for the Computation of the RL Norm, exclusively for its own sake when its use finds situations where uniformly 2 is used as the First Prime. However, when we find Similarity using RL Norm, the RL-Norm should be calculated using 1 as the First Prime.

Comments

The Notation is self-explanatory and is usually, Chapter inclusive only.

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